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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

AN ANALYSIS OF BRANCH STATION STUDIES OF
FINANCIAL ASPECTS OF FARM FORESTRY

By

W. E. Bond, Forest Economist



SOUTHERN FOREST EXPERIMENT STATION
Harold L. Mitchell, Director
New Orleans, La.
May 9, 1952

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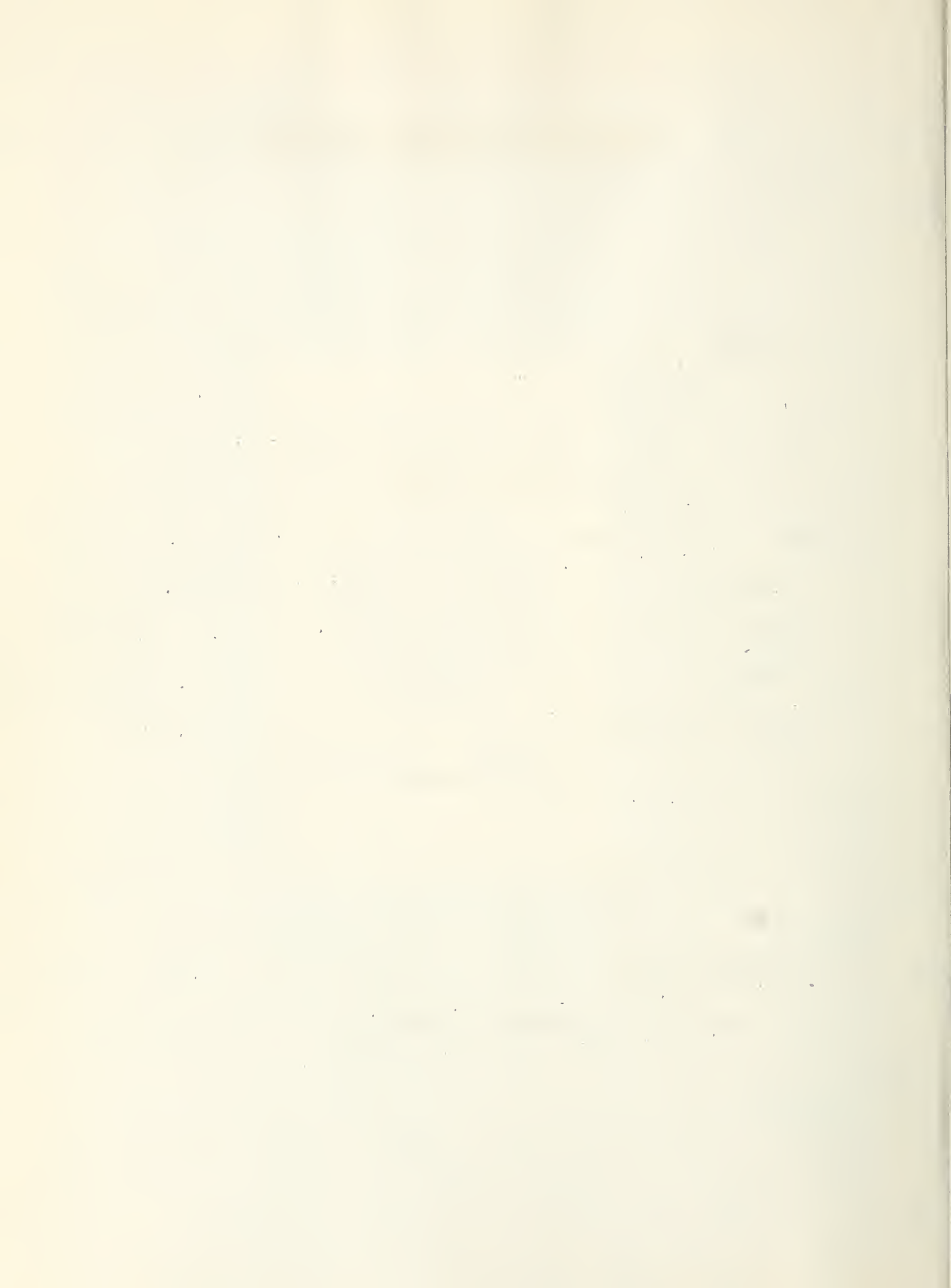
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AN ANALYSIS OF BRANCH STATION STUDIES OF FINANCIAL ASPECTS OF FARM FORESTRY

By

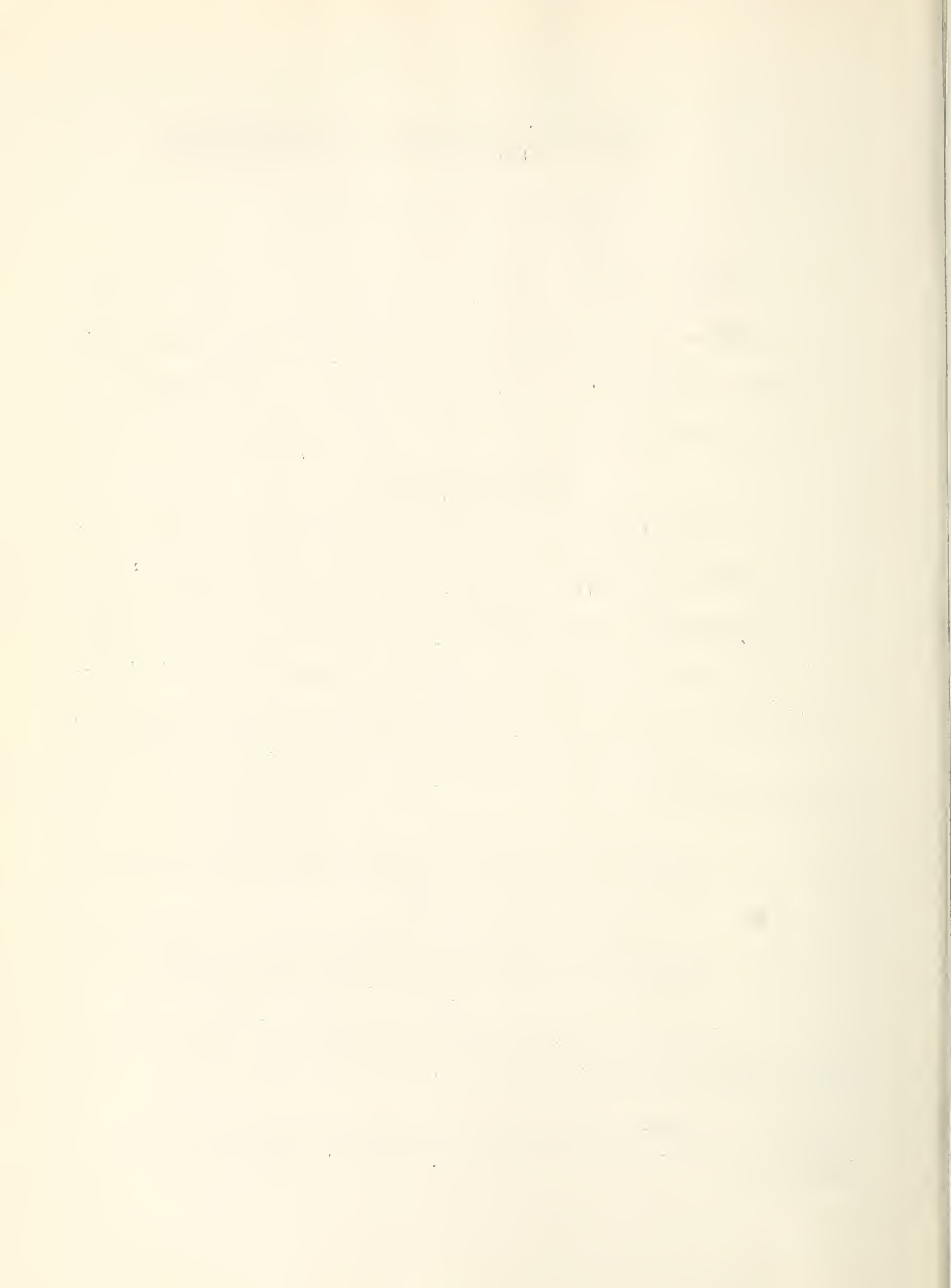
W. E. Bond, Forest Economist

Studies of costs and returns of farm woodland management units are being made on experimental forests at the Alexandria, Birmingham, Brewton, Central Ozarks, Crossett, East Texas, and Tallahatchie Branches. Only the Delta Branch has no farm forestry study.

Objectives of Studies

The main purpose of the studies is to determine by means of pilot plant or case studies on experimental forests the financial possibilities of managing and harvesting timber and other products on small tracts like those commonly found on farms and other small ownerships. This purpose is divided into six more specific objectives as follows:

1. To learn how to apply intensive management practices to small woodlands.
 - a. By using the continuous inventory system to keep records of growing stock and increment and to determine allowable cuts and harvests.
 - b. To devise simple practices which the non-technical forest owner can use and which will approximate the spectacular results of intensive technical management.
2. To determine gross returns from intensive management when the timber is harvested and sold as stumpage, as products at road-side and as products delivered to market.
3. To determine man-hour requirements and out-of-pocket costs of management practices, which are applicable to practices of non-technical owners.



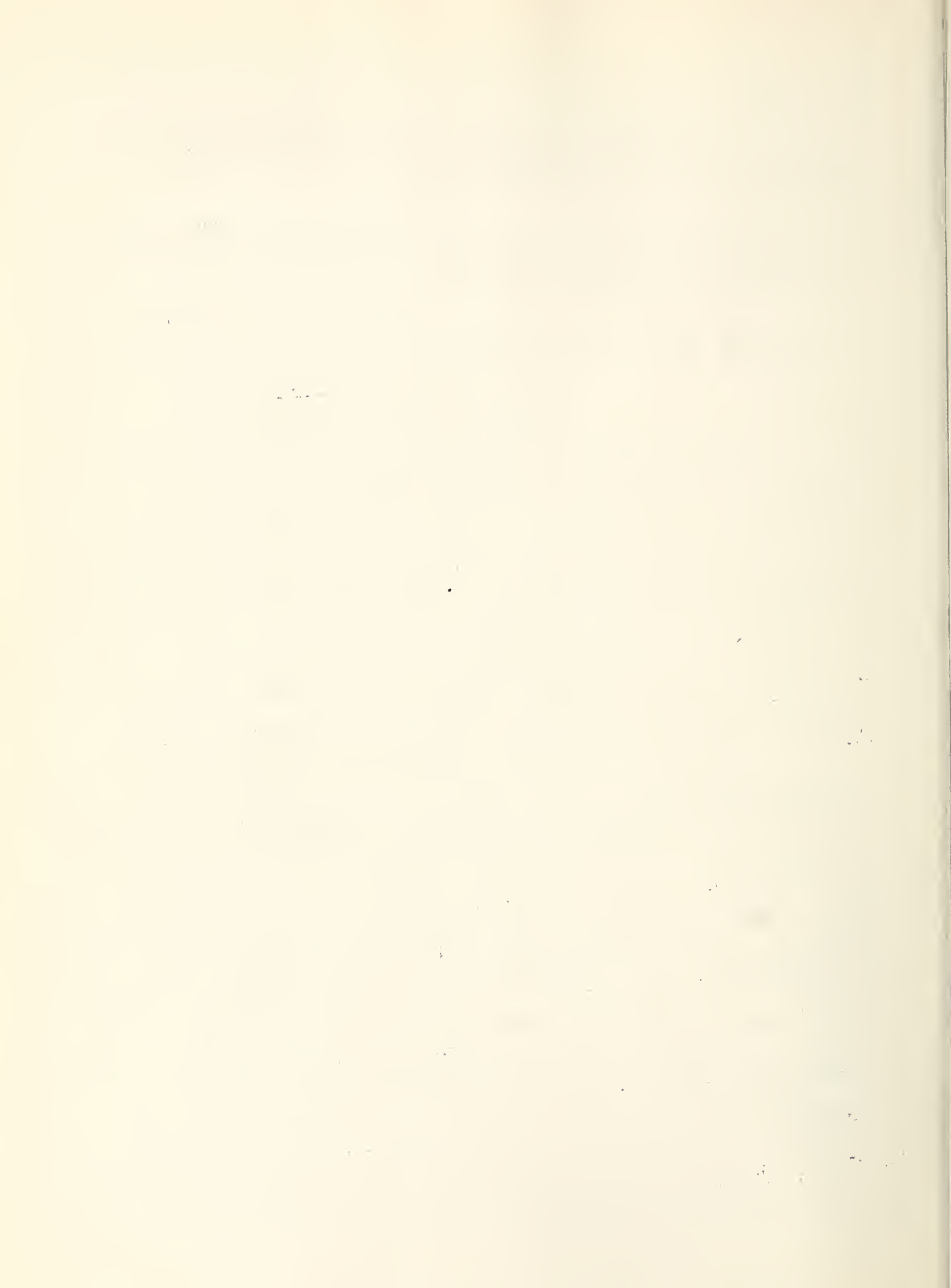
4. To determine requirements in man-hours of labor, team-, tractor- or truck-hours of equipment, and out-of-pocket costs of harvesting and delivering forest products.

5. To determine an approximate measure of the contribution that small forests in different forest types and localities can make to the economy of the South and the Nation.

6. To develop case studies on experimental forests available to extension agencies and small owners.

Comparison of Branch Set-ups

The farm forestry study at each branch is being made on an area on the experimental forest that is more or less comparable in size, in timber species, and in stages of stocking or depletion, to farm woodlands in the Branch's territory. Usually the study unit is about 40 acres of woodland. The chief product grown and harvested at all branches is sawlogs. Pulpwood and other products, as poles, naval stores and cattle, are secondary products. At Birmingham, Brewton, Crossett, and Gulfcoast Branches, both well-stocked and poorly-stocked woodlands have been selected in order to determine (1) how profitable the well-stocked woodland can be and, (2) how long it will take to build poor stocking, which is more commonly found on farm woodlands, up to good stocking and the returns that can be realized while doing this. The East Texas Branch has a single farm forestry unit of 67 acres divided into 5 compartments. One will be cut each year and the second cut in each compartment will be made after the first cut. The compartments vary as to stocking so that in effect well-stocked and poorly-stocked units are being managed. The Central Ozarks Branch has set up several areas of about forty acres



each located in different forest types: one is predominantly cedar; two are predominantly pine; and two are predominantly upland hardwoods. Costs and returns will be determined for each forest type. The effect of different intensities of management are being studied at the Gulf-coast and Tallahatchie Branches.

Results from Studies

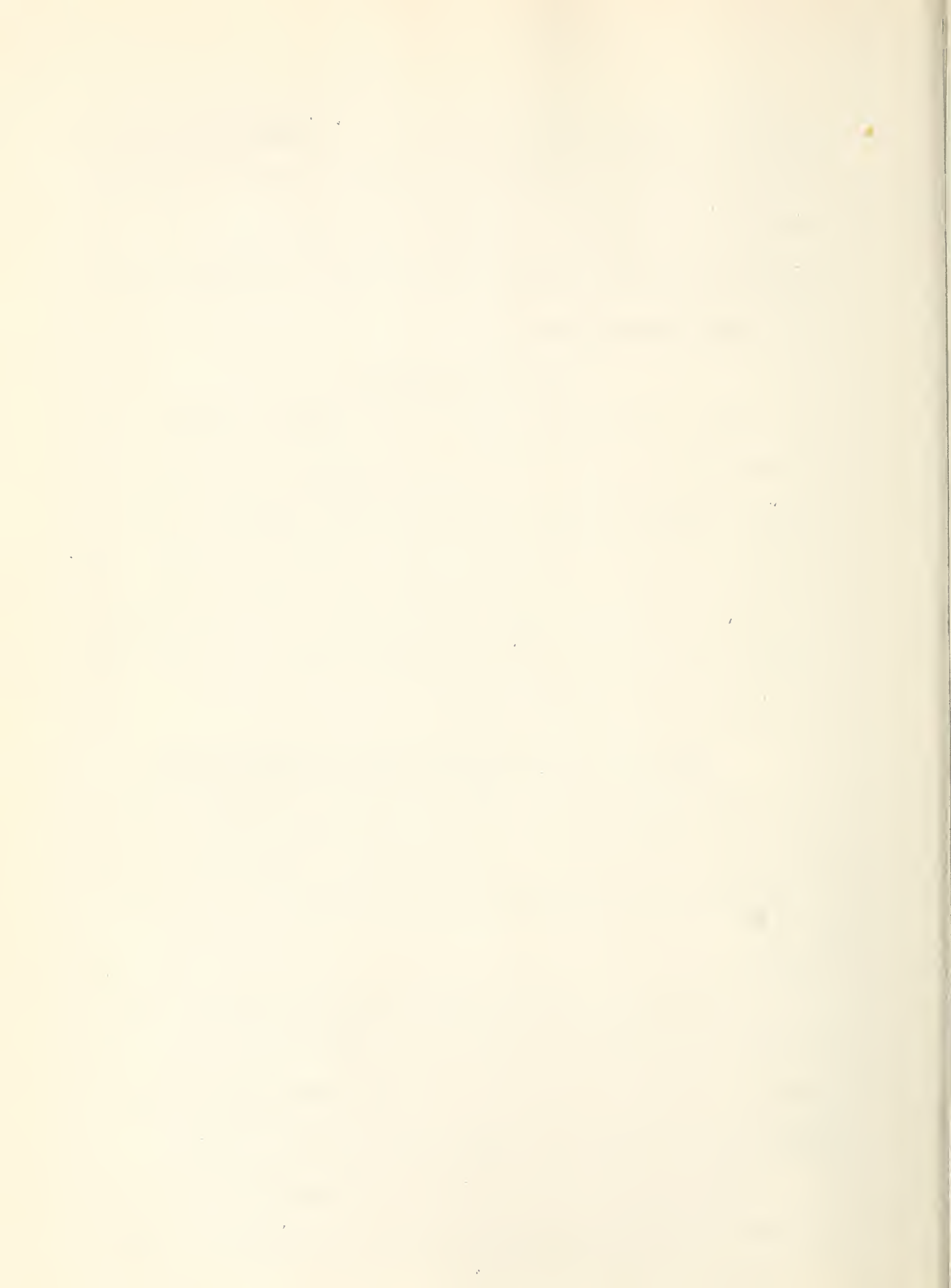
After several annual cuts at various branches, valuable records and management experience have been accumulated. Stands have been improved in quality and built up in quantity of growing stock. These farm forestry units are now of real value as case studies of the economic and practical management phases of farm woods. They are providing a regional sampling of the contribution that small forests can make both to farm income and the national economy.

Systems of Keeping Records and Regulating the Cuts

The Crossett Branch, which operated for more than 10 years before other branches became active, has set up standards for keeping records which have been followed to greater or lesser degree by other branches.

Reynolds has prepared two guides for keeping records, namely (1) "System of inventory and marking and method of handling stand and stock records on the Crossett Forest," and (2) "Methods of handling cost and value records on the Crossett Experimental Forest."

When the farm forestry studies on the "Good" (well stocked) and "Poor" (one time poorly stocked) forests were initiated, the number



of all trees 3.5 inches and larger on each forty were inventoried and tallied by one-inch diameter classes. Trees in the 12-inch and larger diameter classes were tallied by number and grade of 16-foot logs. All trees were tallied by 3 species groups (1) pine, (2) red and white oak, and (3) other merchantable hardwoods. Volumes of all trees inventoried were computed in cubic feet inside bark by using volume tables developed at Crossett. The volume of sawlog trees (12 inches and larger) were also computed on a Doyle, International, and Scribner board-foot basis, using converting factors. A permanent ledger record was next made of number of trees and cubic and board-foot volumes for each forty. Also recorded were numbers and volumes of trees marked for cutting each year and finally the scaled volumes of the logs and other products which were cut out of the marked trees. At 5-year intervals, each forty is re-inventoried and the results are recorded in the ledger in the same form as for the original inventory.

The annual cuts are regulated so as to (1) improve growing conditions and quality of the standing timber, (2) provide for building up the volume of the stand by cutting less than the growth, and (3) insure a good annual income. The amount of the allowable cut is determined by comparing the inventories of timber at the beginning and end of each 5-year period to see how much the volume has been increased, and then by selecting an appropriate percentage of this increment to cut. On the "good" forty a volume practically equal to the annual increment has been cut each year, while on the "poor" forty only about half the increment

has been cut. In marking the allowable cuts the most mature and poorest trees in the stands were selected. Defective, limby, damaged and decadent slow-growing trees have been marked. Dense, over-crowded groups have been thinned. Greater yields of higher-quality timber is the purpose of management.

Because "dollars and cents" are the most practical measure of success in management, records of financial returns are kept by the Crossett Branch in addition to volume yields. Values of products harvested and values of growing stock are recorded both as stumpage and in terms of delivered products. The stumpage prices used have been based on local current prices, and log grades harvested have been considered in arriving at these stumpage prices. This is true also of delivered prices of products. It has been found necessary to obtain prices from a number of reliable purchasers of forest products and to average them in arriving at values available to forest owners who have forest products for sale. In past years there were few stumpage or delivered prices that reflected the increased values of higher grade logs. At present, however, logs are being purchased by log grades by at least one large operator in the Crossett territory, and these prices are proving of great assistance in setting stumpage and delivered prices for logs of various grades harvested on the farm forties.

The Crossett Branch does its own logging of all products harvested from the experimental forest and keeps records in man-hours and dollar costs of each operation on the farm forties. Based on these logging-cost

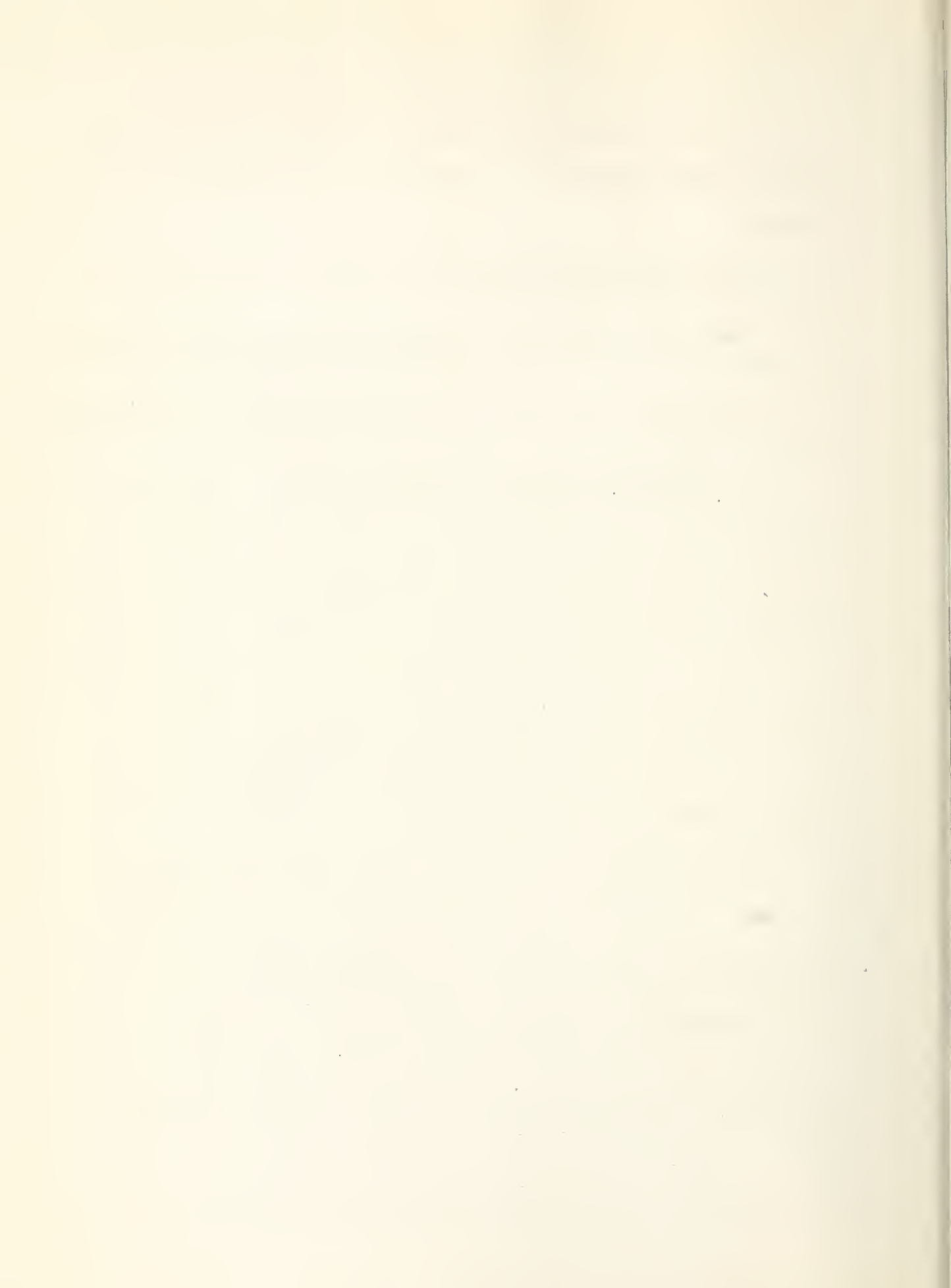


records and on the stumpage and delivered values, the returns per hour of labor in cutting and delivering products have been computed for the following:

1. Man-hour return with no deduction for stumpage, management costs or out-of-pocket logging costs.
2. Man-hour return after deduction of stumpage value, but with no deduction for management costs or out-of-pocket logging costs.
3. Man-hour returns after deduction of management costs and all costs of logging except labor but with no deduction for stumpage.

The Birmingham Branch keeps about the same records as the Crossett Branch. It made 100 percent inventories on the "good" and the "poor" forties at the time the studies were initiated. Both pine and hardwoods were tallied by one-inch diameter classes, log lengths and tree grades. The next inventory is not due until the 5-year cutting cycle ends in 1952. During the first cutting cycle the annual increment has been estimated to equal 6 percent of the growing stock volume and the cut is regulated to 80 percent of this increment.

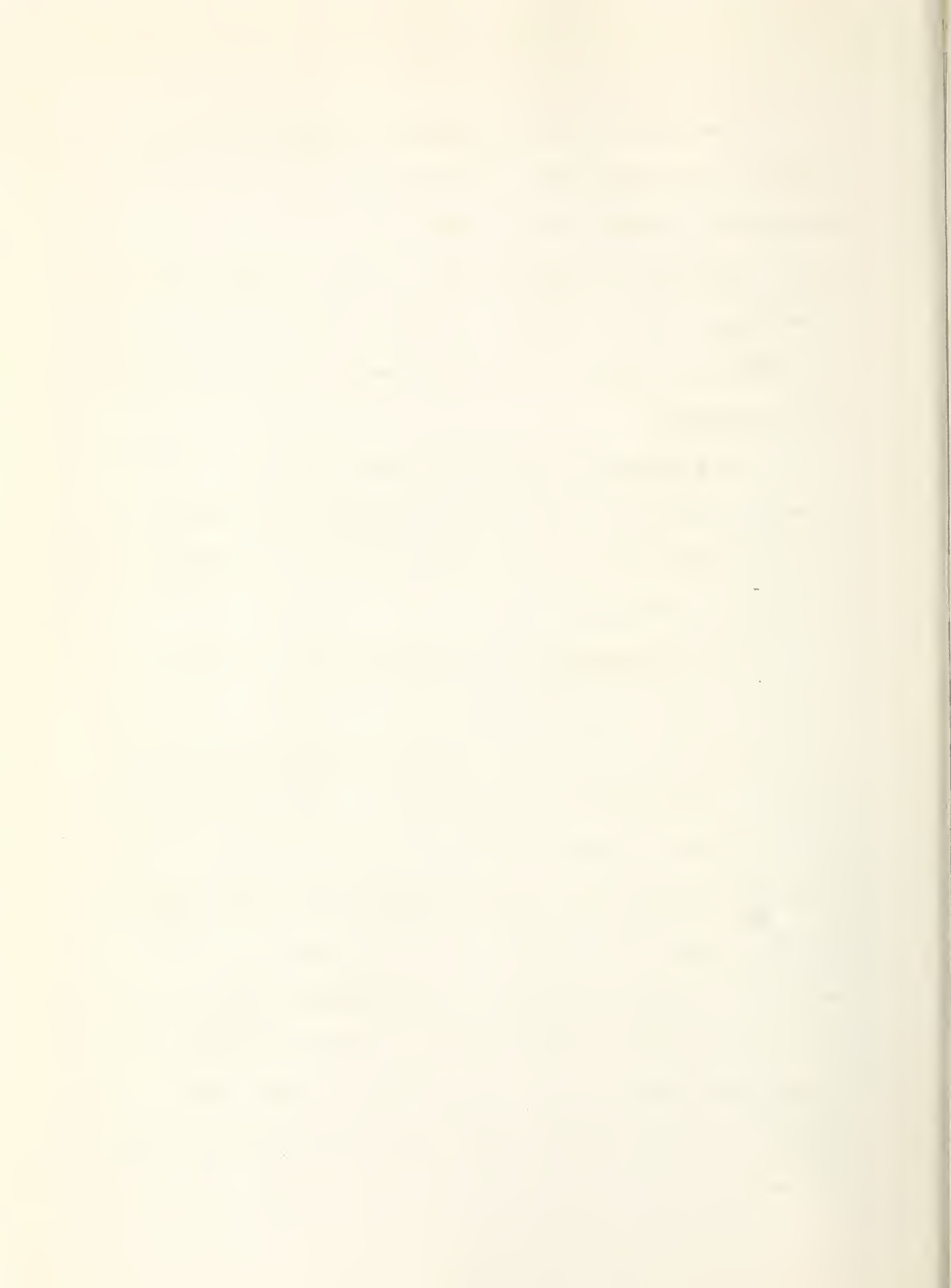
Four annual cuts have been made. The volume of sawlogs and mine props harvested in board feet (International 1/4-inch rule) and cubic feet and the value of delivered logs and props have been recorded. The Birmingham Branch does its own logging and keeps records of each operation in man-hours of labor and out-of-pocket costs. The stumpage value of each product harvested is also computed, based on local stumpage prices. The costs of taxes, fire protection, marking, and other management costs are kept both in dollars and man-hours where applicable.



From these records the Birmingham Branch computes the average return per hour to the farmer, who spends time marking trees to be cut and in cutting, scaling and delivering products. These returns per man-hour are shown for: (1) delivered value of products without reduction for stumpage, management costs, or any logging costs, (2) delivered value of products less stumpage value and less out-of-pocket costs of management and logging.

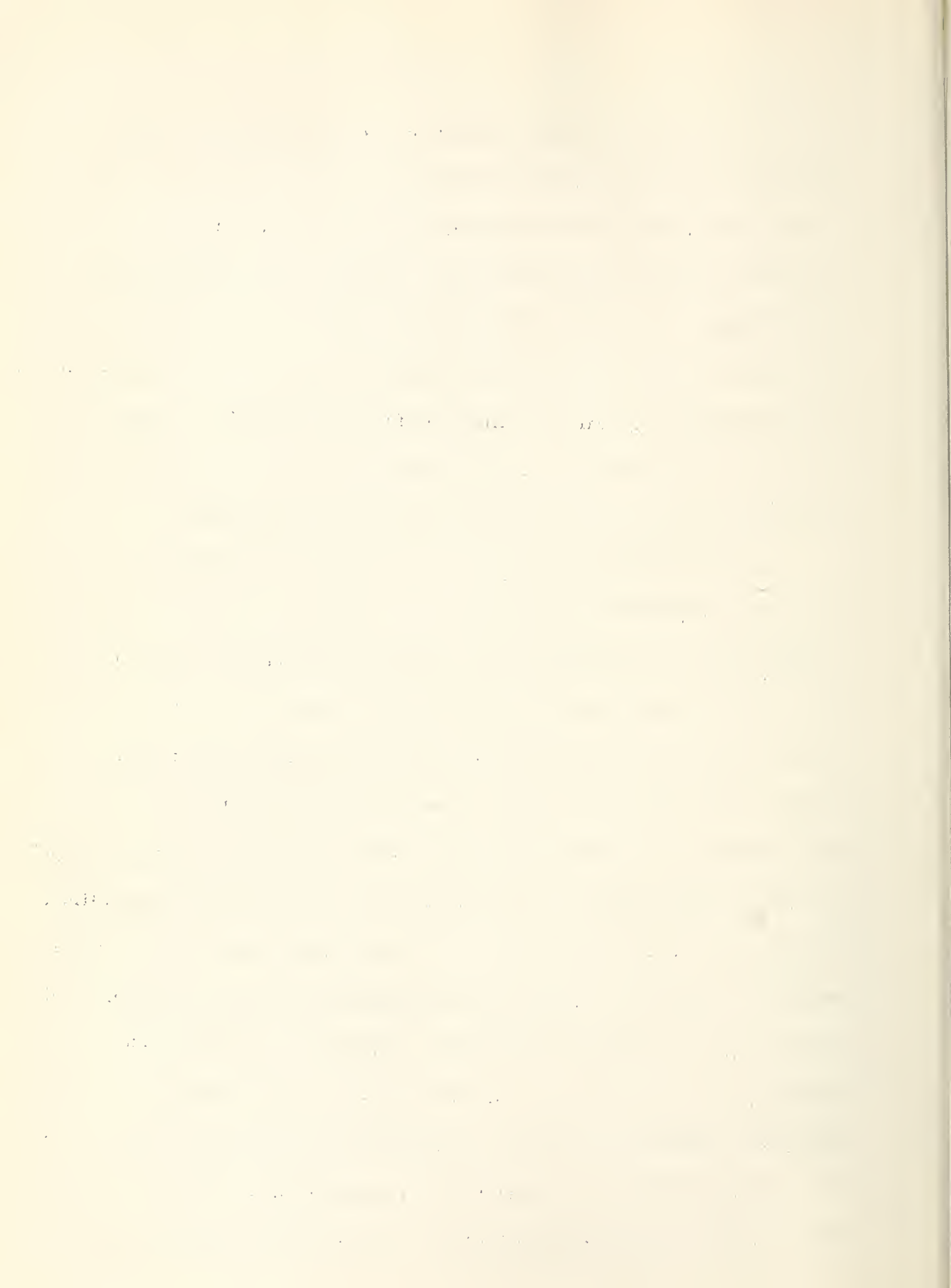
The Birmingham Branch also computes annual per acre net stumpage (less taxes) returns and net realization values (delivered price value less labor and out-of-pocket costs of management and logging, but not deducting stumpage).

At the Brewton Branch, records of inventory and annual costs and returns have been kept four years for a "good" and a "poor" forty. The original 100 percent inventory was made on the same basis as at Crossett. The allowable annual cut was set as two-thirds of the increment, which was estimated to be 6 percent of the growing stock volume. At the end of 5 years, more accurate growth figures will be obtained from reinventory. The products harvested include posts, fuel wood, sawlogs, pulpwood, and naval stores. The Brewton Branch produces all products but contracts for hauling to plants. Records of man-hours for producing each product are kept. The out-of-pocket costs, including tools, rental of tractor and contract costs of truck delivery, for each product are also recorded. Until 1951 current delivered value of each product



was recorded and from this the out-of-pocket cost was then deducted. This return included the value of stumpage as well as payment for labor required in producing the product. By applying current wage rates to the man-hours required in producing each product and then subtracting this cost from the cash return, a value for stumpage alone was obtained. At Brewton, however, these computed stumpage values were generally below current stumpage values available to farmers so, in 1951, stumpage and delivered values which more nearly approximated the averages for the region were collected and used instead of local current figures.

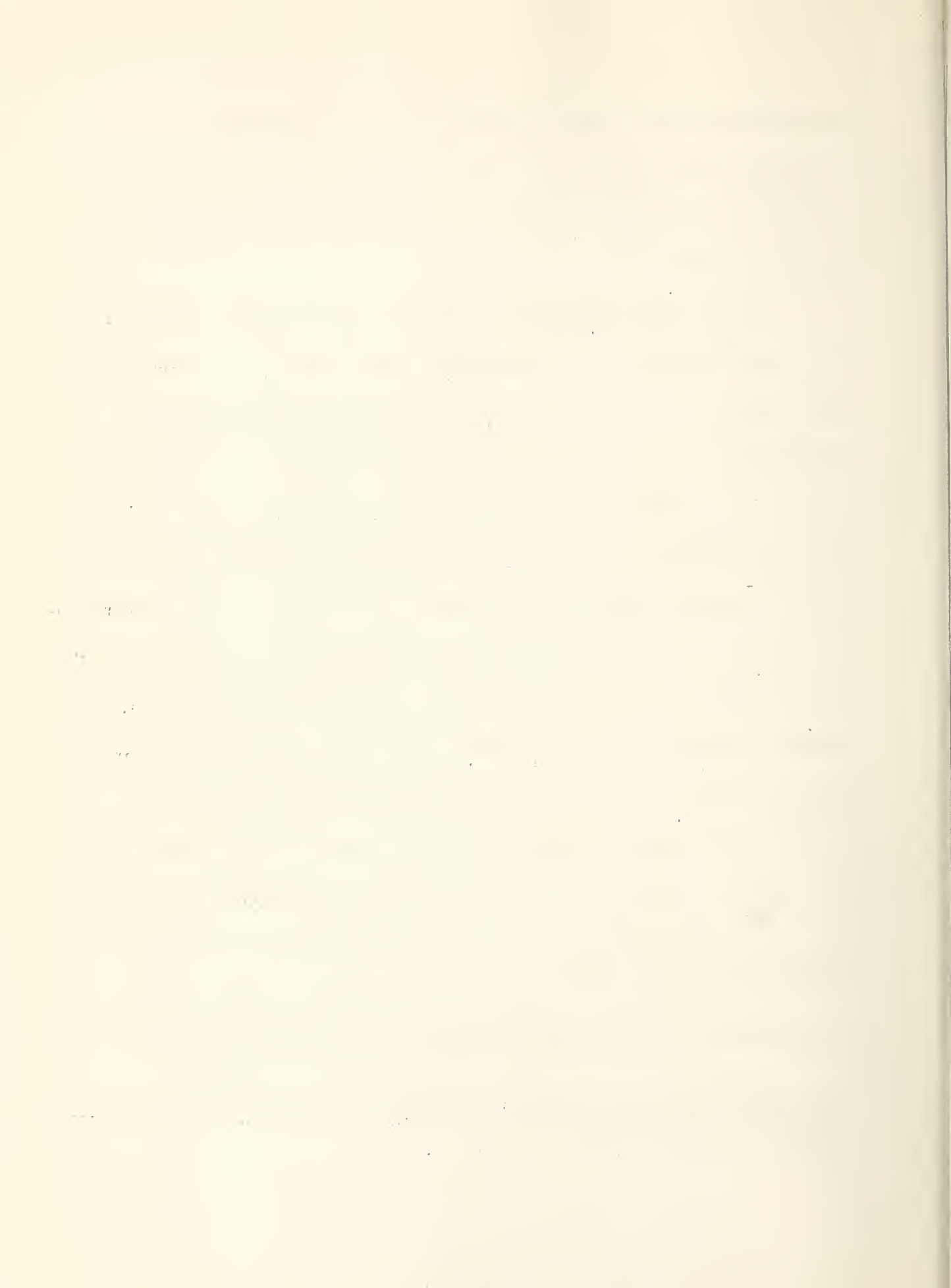
The East Texas Branch has a farm forestry unit of 67 acres, but cuts approximately a fifth of this area annually, and uses a 5-year cutting cycle on each compartment. At the beginning of the study a 100 percent inventory was made following the Crossett method. Each cut is an improvement cut taking the poorer and defective trees. The volume of the cut is held to about two-thirds of the estimated increment. The products cut are sawlogs and posts. There has not been enough pulpwood for a commercial cut. Local farmers are hired to do the felling, bucking, and skidding to the road side, and man-hour time records are kept of each operation. The values of sawlogs and posts are computed as stumpage, as delivered to road side, and as delivered products to plants, using current prices. No out-of-pocket costs of logging and delivering products are recorded. Furthermore, man-hours required in loading and hauling products are not recorded, but are estimated from U. S. D. A. Technical Bulletin 861. Based on these recorded and



estimated man-hour requirements for production and hauling and on road-side and delivered values, the gross returns per man-hour for sawlogs and posts are computed. No deductions for stumpage or any costs are made.

The Gulfcoast Branch has completed 4 years of operations on four farm forestry forties, two "good" and two "poor." All forties were inventoried at beginning of the study following the Crossett method. Growth was estimated and allowable cuts set below the volume of increment. The products harvested are sawlogs, pulpwood, posts, poles, fuel wood and naval stores. The wood products are sold as stumpage but the value of products cut and skidded to road side are also estimated. Delivered prices are not obtained. Turpentine is carried out by Gulfcoast employees and crude gum is delivered by contract to a still. Man-hours required to produce (but not deliver) each product are obtained from contractors doing the work or from Gulfcoast employee time records in the case of naval stores. Out-of-pocket management costs are collected. Based on the above records the following are computed:

1. Net stumpage return per acre after deducting out-of-pocket costs of cultural operations.
2. Hourly return for labor based on road-side values after deducting out-of-pocket costs of production and cultural practices.
3. Hourly return for labor based on road-side values but after deducting stumpage and lease values and also out-of-pocket costs of production and cultural practices.



The Tallahatchie Branch is keeping records of yields, costs and returns on three farm forestry units. The continuous inventory system is used. Instead of recording trees by log length, however, trees are tallied by diameters only. A local volume table is used to determine volumes. Log grades are also omitted.

At the Central Ozarks Branch, the 5 management units are still in the process of being installed. Trees are tallied by diameter only. Log lengths and grades are not taken. Local volume tables have been constructed. Incomes and management and logging costs are recorded.

Making Results Available to Forest Owners

At all branches the farm forestry compartments have been developed as case studies of profitable farm forestry. They are made very effectively available to county agents and groups of small owners by holding annual field days at which time sawlogs, pulpwood, gum and other products from the annual harvest are decked at an accessible spot. Visitors are chiefly local farmers and county agents but the latter sometimes bring farmers from a considerable distance. Visitors are always impressed and astonished at the large volume of forest products that can be annually grown and harvested from a small woodland area.

Brief mimeographed summary statements of volume and value of products harvested annually are prepared for distribution to visitors at the several branches. The Crossett Branch, in 1951, prepared such a statement for the 14th cut on the good and the poor farm forestry forties.

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The following items were included:

1. Number of trees, volume of growing stock in cubic feet and in board feet, and annual board-foot increment for original stand and for present stand.
2. Accumulated total and per acre volume of cuts by products from the time farm forties were established.
3. Accumulated total and per acre and average per acre per-year and per-unit values of harvested products, both as stumpage and as delivered products.
4. Total volume of each product cut during the last year.
5. Total and per-acre and per-unit value of each product harvested during the last year as stumpage and as delivered products.
6. Man hours per-forty and per-unit and per-acre employed during the past year in cutting and delivering various products.
7. Returns per hour of labor in cutting and delivering
 - a. With no deduction for stumpage, management costs or logging costs.
 - b. After deducting the value of stumpage but with no deductions for management costs or costs of logging.
 - c. After deducting the management costs and all costs of logging except labor but with no deduction for stumpage.

An annual office report of progress is made by most branches.

It records volumes and values of products produced, costs of production, details of planting and stand improvement, and other essential facts and data. This report is not made public, but significant items are used in the Station's annual report.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
JANUARY 1950

TO THE HONORABLE CHAIRMAN OF THE BOARD OF TRUSTEES
OF THE UNIVERSITY OF CHICAGO
FROM THE DEPARTMENT OF CHEMISTRY

RE: REPORT ON THE PROGRESS OF THE RESEARCH
DURING THE YEAR 1949

The following is a summary of the work done in the Department of Chemistry during the year 1949. The work was carried out under the direction of the Department Chairman, Professor [Name], and the assistance of the following faculty members: [List of names].

The work was carried out in the following areas: [List of research areas]. The results of the work are summarized in the following tables: [List of tables].

The work was supported by the following grants: [List of grants]. The work was carried out in the following laboratories: [List of laboratories].

At the end of each 5-year period, when the 100 percent re-inventory is made, the branches make a more comprehensive progress report on each farm forestry unit. This covers changes in volume and quality of the growing stock, periodic increment, products harvested, gross returns, costs, and net returns. Forestry practices followed are covered and estimates of the future allowable cuts are made. Articles in farm papers and trade journals covering two or more years of farm forestry results have been published by several of the branches.

Some Pertinent Findings

Analysis of the set-ups, results, record-keeping, regulation of cuts, and reports of studies of financial aspects of farm forestry at the various branches shows that practices and methods are not uniform. With products harvested and with degrees of intensity of forest practice varying considerably at the branches, uniform practices and methods cannot always be expected. This analysis, however, affords the opportunity to pick out those practices which seem ~~to~~ best for these studies and to point out those which seem to be undesirable. This has been done below under four subject matter headings:

I. Silviculture

Each branch uses that method of silviculture which will improve the quality and build up the quantity of growing stock. The method varies with forest type but is the one generally accepted as best for that particular type and locality. Hardwood control, planting, and prescribed burning where necessary are included with improvement cutting and thinnings.

The methods used seem satisfactory and there are no undesirable practices that need be cited.

II. Regulating the cut

All branches use periodic 100-percent reinventories to determine increment and changes in structure and quality of the growing stock. The allowable cut is held to a percent of the actual or estimated increment and is gradually increased as stocking is built up. When optimum stocking is reached, the full amount of the increment will be cut. Annual cutting, as generally practiced, is desirable but if not commercially feasible in poorly stocked units, then a waiting period should be recognized and periodic cuts may be necessary until stocking has been built up to that point at which annual cuts are feasible.

All branches, except Central Ozark and Tallahatchie, inventory trees by log lengths and log or tree grades. After a few years of experience it now seems desirable to tally trees by diameter classes only. The reason is the possibility and probability of serious errors in judging merchantable lengths and log grades which may result in significant errors of increment. It now appears advisable to use refinement beyond diameter classes only at branches--Crossett for example--where much timber is marked and cut and men constantly can check their ocular estimates. Local volume tables by two- or one-inch diameter classes, based on cubic foot, International 1/4-inch, local Doyle, and sometimes Scribner rules, are required. Local volume tables can be converted to each of the four scales by accumulating the sums of D^2 , D and number of



trees and then applying the proper coefficients. These, however, are not yet available but Grosenbaugh is planning to derive them, following methods used in Occasional Paper 126 for converting cubic volume of products to board foot volumes. Crossett's method of measuring cubic feet per log using the small diameter as the base of a cylinder is undesirable for other branches. New volume tables will be required if and when average form class and merchantable length of trees are changed with management. Log- or tree-grades have been recorded for the original inventory at most branches and do not need to be rechecked until significant changes in quality with management are apparent.

III. Harvesting

The greatest variations in practice at the branches occur in harvesting the timber. The Crossett Branch has woods crews that cut and deliver pulpwood and sawlogs to the mills the year around. Operations are efficient. Detailed man- and machine-hours and fixed and operating costs are kept. The small owner could not duplicate this type of logging, but these cost figures for efficient logging are very valuable to the Southern Station. The East Texas Branch hires local farmers to do the felling and skidding and then contracts the hauling. Other branches have various practices between these two extremes. They are all of value and it seems advisable to refrain from standardizing logging practices. Furthermore, because few farmers do their own logging it seems inadvisable to standardize the system of recording logging costs or to require the branches to collect detailed costs beyond those actually incurred on their own operations.

1. The first part of the paper is devoted to the study of the

properties of the function $f(x)$ defined by

$$f(x) = \sum_{n=0}^{\infty} \frac{a_n}{n!} x^n$$

$$a_n = \frac{1}{n!} \int_0^1 f(x) x^n dx$$

$$a_0 = f(0)$$

$$a_1 = f'(0)$$

$$a_2 = \frac{1}{2} f''(0)$$

$$a_3 = \frac{1}{6} f'''(0)$$

$$a_4 = \frac{1}{24} f^{(4)}(0)$$

$$a_5 = \frac{1}{120} f^{(5)}(0)$$

$$a_6 = \frac{1}{720} f^{(6)}(0)$$

$$a_7 = \frac{1}{5040} f^{(7)}(0)$$

$$a_8 = \frac{1}{40320} f^{(8)}(0)$$

$$a_9 = \frac{1}{362880} f^{(9)}(0)$$

$$a_{10} = \frac{1}{3628800} f^{(10)}(0)$$

$$a_{11} = \frac{1}{39916800} f^{(11)}(0)$$

$$a_{12} = \frac{1}{479001600} f^{(12)}(0)$$

$$a_{13} = \frac{1}{5810918400} f^{(13)}(0)$$

$$a_{14} = \frac{1}{70859040000} f^{(14)}(0)$$

$$a_{15} = \frac{1}{868308480000} f^{(15)}(0)$$

$$a_{16} = \frac{1}{10822617600000} f^{(16)}(0)$$

$$a_{17} = \frac{1}{136533024000000} f^{(17)}(0)$$

$$a_{18} = \frac{1}{1741929600000000} f^{(18)}(0)$$

$$a_{19} = \frac{1}{22645081600000000} f^{(19)}(0)$$

$$a_{20} = \frac{1}{296586240000000000} f^{(20)}(0)$$

$$a_{21} = \frac{1}{3875601280000000000} f^{(21)}(0)$$

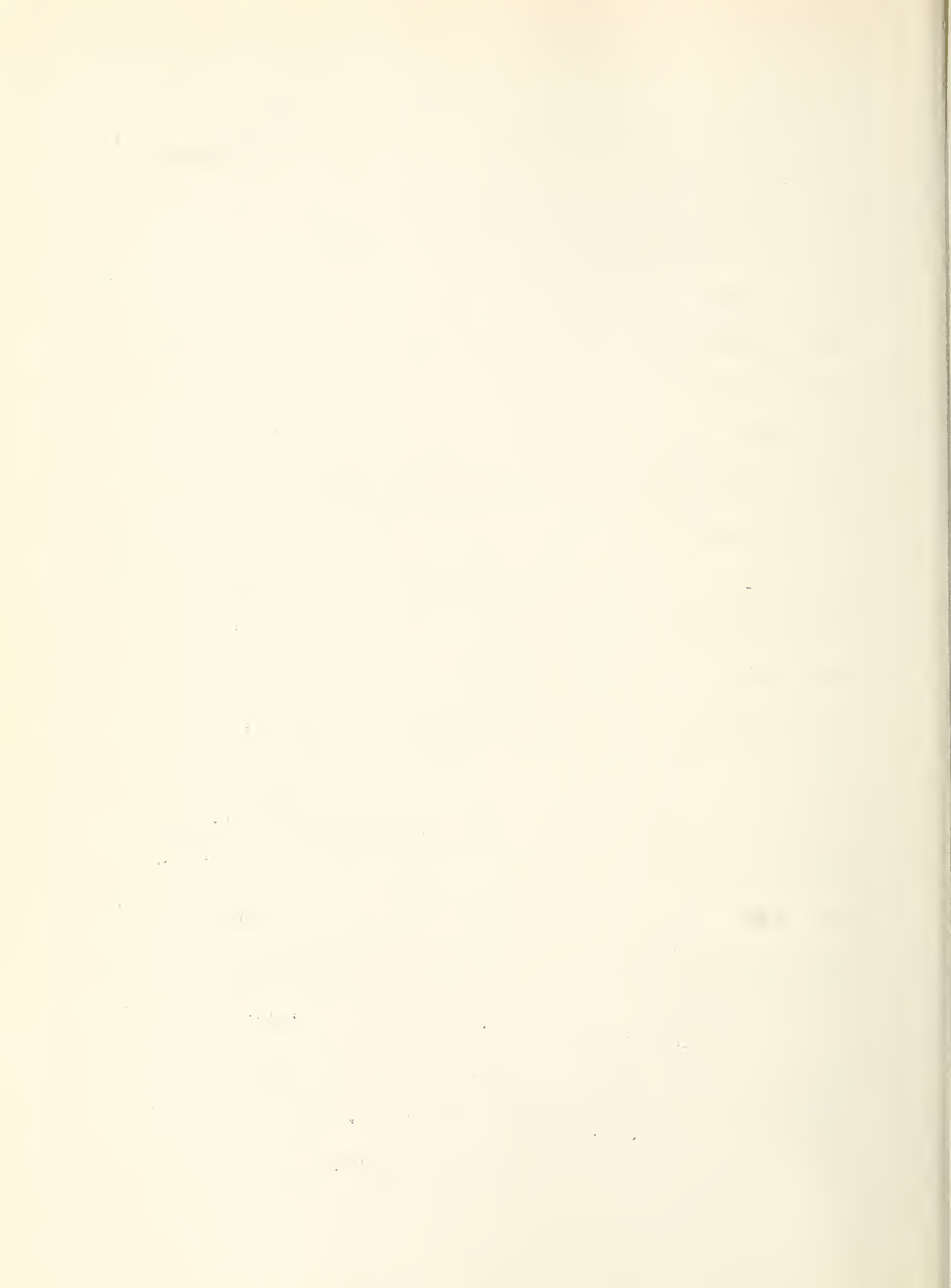
$$a_{22} = \frac{1}{50582822400000000000} f^{(22)}(0)$$

$$a_{23} = \frac{1}{661576704000000000000} f^{(23)}(0)$$

$$a_{24} = \frac{1}{8611511040000000000000} f^{(24)}(0)$$

$$a_{25} = \frac{1}{112159641600000000000000} f^{(25)}(0)$$

- Another problem is whether to use stumpage, road-side, or f. o. b. plant values for harvested products. At Birmingham, mine props and other products cut from low grade hardwoods have little if any stumpage value, but have considerable value when delivered to mine or mill. At Brewton, and at other branches where products are property of the company leasing the experimental forest to the government, products cannot be sold and competitive stumpage and delivered values cannot be obtained from actual sales. The Brewton Branch has found that calculated stumpage prices, based on delivered prices at the company mill and actual contract logging costs, were well below average stumpage prices. To remedy this, the Branch now collects current stumpage and delivered prices from several well-established purchasers, scattered throughout the Branch's territory, and averages them. Crossett also finds this method very satisfactory and it seems advisable to use it at other branches where it is impossible to sell in competitive markets. Only Crossett collects values by log grades. At present this appears to be impractical at other branches. None of the branches have sold products at roadside, but many small owners could cut and skid logs and pulpwood and collect gum for sale at roadside, even though they do not have trucks for hauling. It seems advisable for the branches to attempt seriously to obtain man-hour requirements for the labor involved and the value added above stumpage prices when products are produced and sold at roadside.

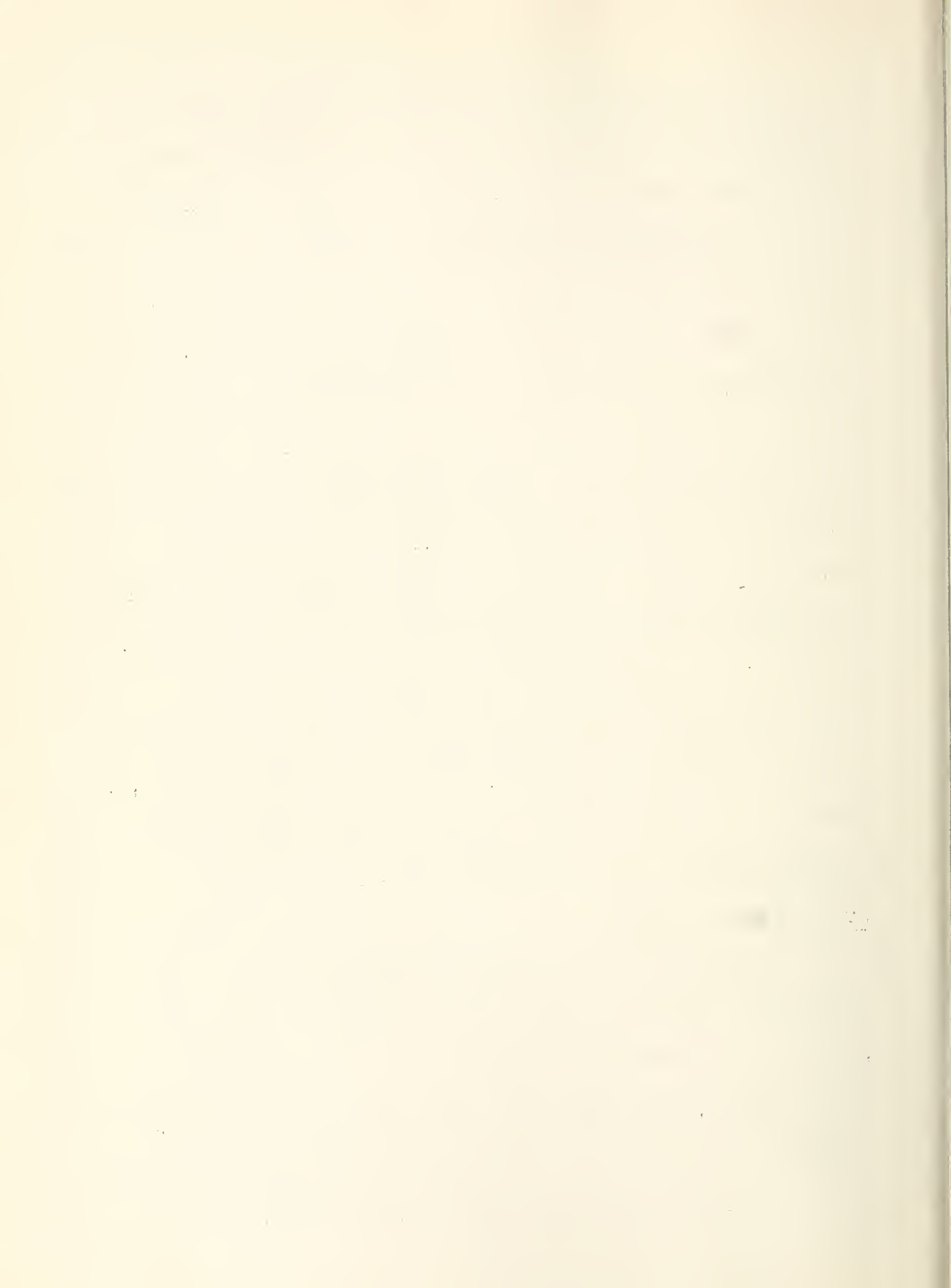


When the trees are marked for cutting, they are tallied for deduction from the inventory record. Volumes are calculated using the local volume tables and deducted from the total volume of growing stock. This information fulfills all the needs of the continuous inventory system. However, after the marked trees are felled and cut into logs, poles, posts, pulpwood or other products, they are again measured in approximately similar units, as board feet (usually local Doyle rule), cords, or the like by the purchaser or cooperator. The branches check the scale and the purchaser or cooperator pays for the products according to this scale. If dimensions are available, conversion to the several scales can be made. Usually dimensions of products are not available and it is impossible to convert the scale of all products to a cubic foot basis. There is little practical value in obtaining cubic foot measure for these harvested products and it is better to keep this record of yield entirely separate from the continuous inventory record. In fact, if the scale is not needed for man- or equipment-hour records or other specific purposes, there seems little need of this effort.

IV. Reporting results

Each branch prepares annual and periodic progress reports. The more complete periodic report is made at the time the periodic 100-percent reinventory is obtained.

The Brewton Branch, for example, has prepared comprehensive annual reports while the Crossett Branch has issued only mimeographed statements each year showing volume and value of total yields from



time of establishment and yields for the current year. It is unnecessary to spend more time on the annual progress report than is needed to record vital statistics and other data which will be used in the detailed periodic reports. These essential data should be recorded in ledgers and in brief office reports. A mimeographed summary of yields for distribution to visitors is desirable.

Only Crossett has yet made a reinventory, however, the periodic reports when made by other branches should be comprehensive enough to show: how growing stock has built up, what volume and dollar yields have been obtained, what silvicultural practices have been used, and man-hour and cash costs of managing the farm forestry unit. Briefer articles, summarizing the periodic results, are desirable for publications reaching farmers and other owners of small woodlands.

At the end of each calendar year the branches send pertinent yield, income, and cost data applying to farm forestry compartments for use in the annual report of the Southern Station. These data often are not, but should be, on a per acre basis and expressed in similar units of measure to be most readily comparable. It is not always possible, however, to use uniform units of measure. For example, the Doyle, Scribner, and International 1/4-inch rules are used at various branches to measure the logs harvested and conversion to other scales is impossible because log dimensions are unknown. Time could be saved both at the branches and in New Orleans, if each branch would supply only pertinent yield and cost data. In the next section these data are defined more specifically.



Recommendations for Conduct of Studies

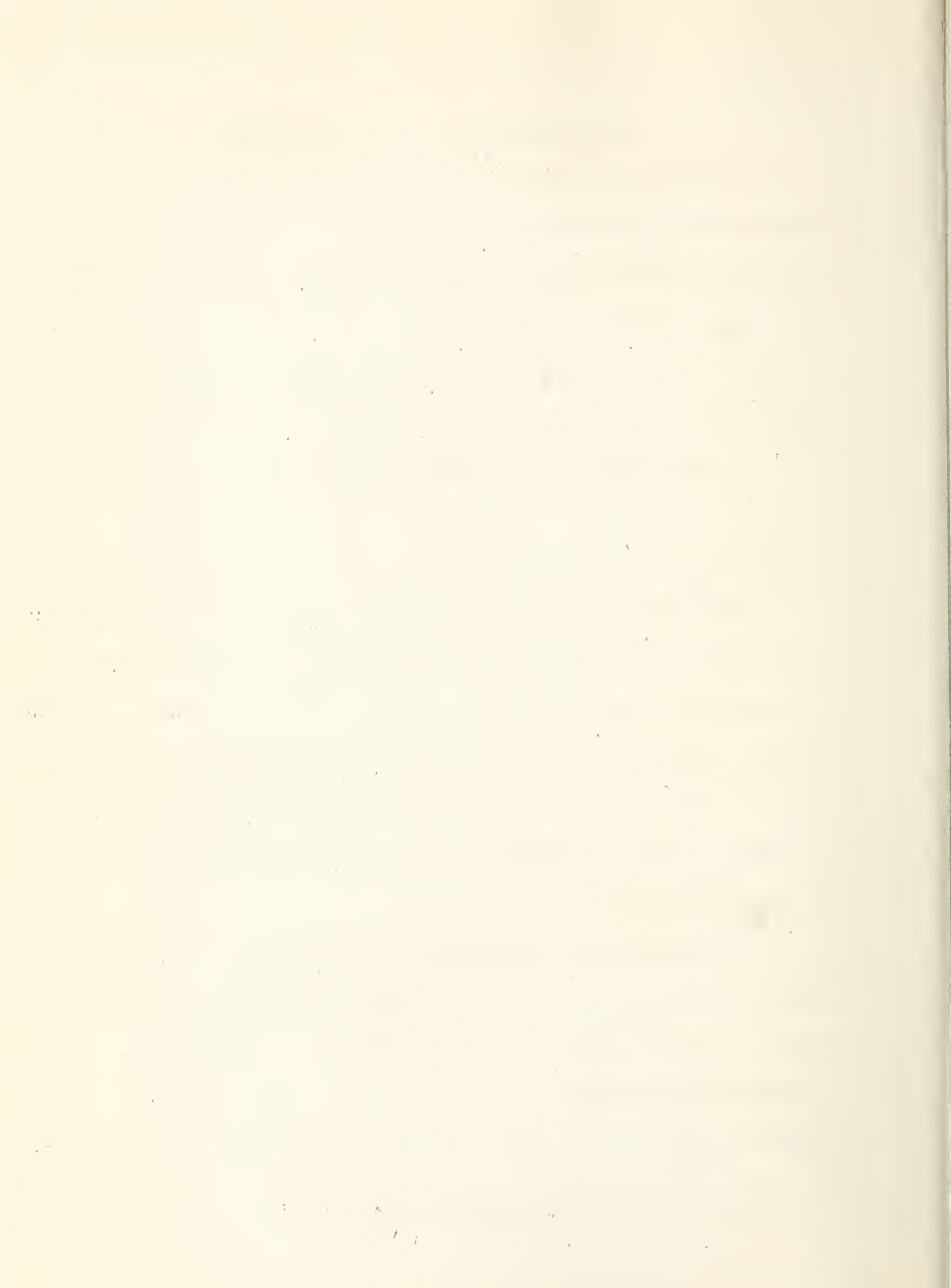
The following recommendations for conduct of studies of financial aspects of farm forestry are made as guides to assist the branches: (1) in limiting their efforts to essential operations, practices, and reports, and (2) in making studies more uniform and thus more useful. They were drafted after carefully considering the many helpful and pertinent suggestions received from the branches. They are grouped under the same subject-matter headings as were used in the preceding section.

I. Silviculture

Silvicultural methods will not be studied, but the method generally accepted as best for the forest type and condition present on each farm forest unit will be used. Stand improvement, hardwood control, prescribed burning, planting, and other practices at each branch will be done according to the approved working plan. Records of man-hour requirements and other out-of-pocket costs will be kept (see table 5, page 28).

II. Regulating the Cut

The continuous inventory system with 100 percent reinventories of trees at 5-year intervals will be continued. Stand and stock tables will be recorded in a ledger. Periodic annual increment will be obtained by (1) subtracting the volume of the stand after cutting at beginning of the period from the volume of the stand after reinventory, (2) adding the inventory volume of trees cut during the period (scale of products cut will not be used) and (3) dividing by five.



Unless a series of records would be disturbed at a branch, it is recommended that trees be tallied only by appropriate species groups, and by two-inch diameter classes. Tallying by one-inch diameter classes almost doubles the work of compilation. Tallying trees by log-lengths is not recommended because cruisers often cannot predict utilizable heights accurately and serious errors may be introduced into increment calculations based on consecutive inventories. Adequate local volume tables, based on a sufficient number of measurements of trees on the compartment or of similar trees on adjacent areas are necessary. In their construction, average tree form and merchantable length for each species or species group by diameter classes should be established. It is possible that volume tables will need to be revised after 15 to 20 years of management. Re-tallying by log- or tree-grade is recommended only when management has progressed far enough to measurably change quality.

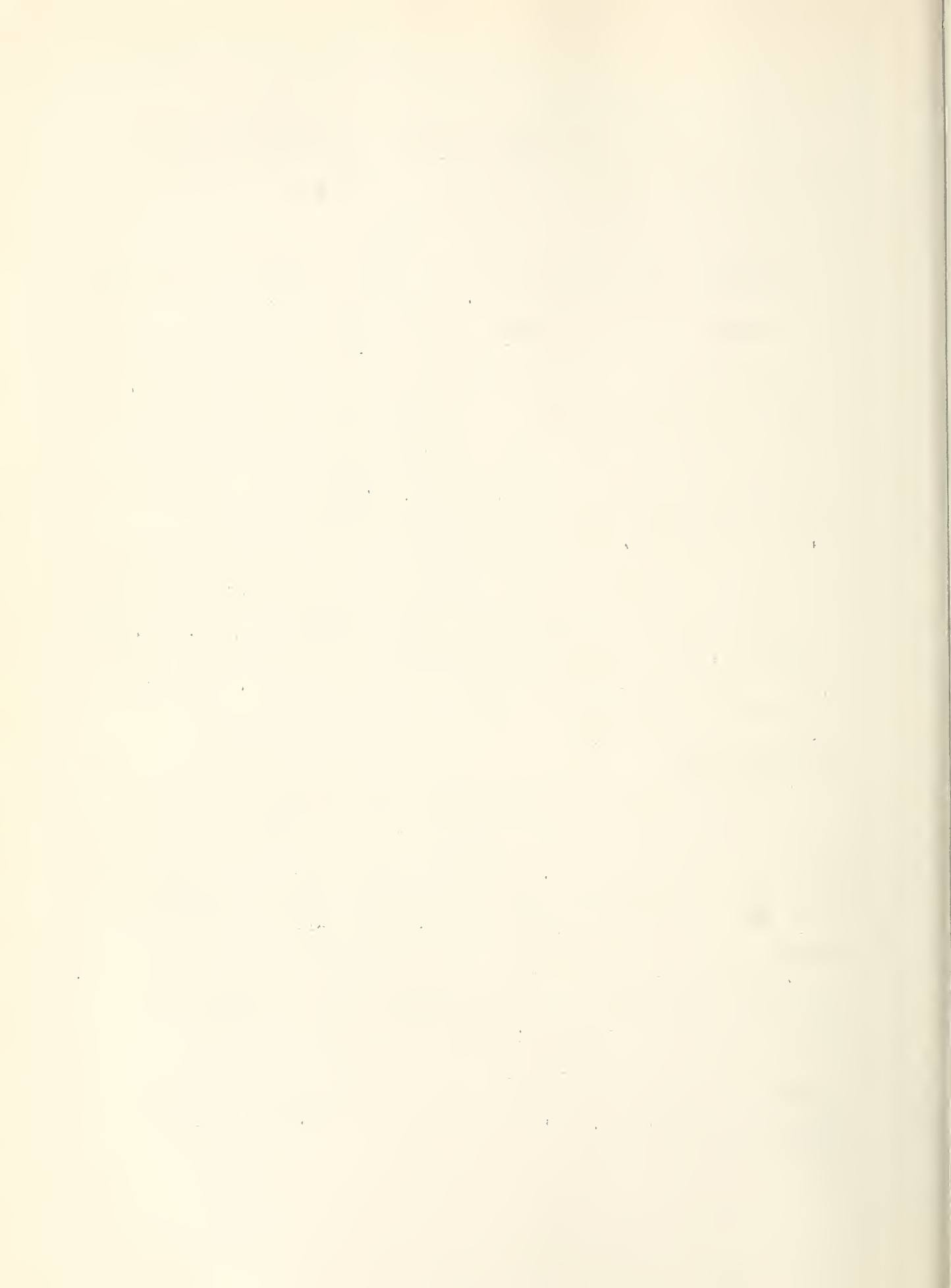
Volumes will be computed in cubic feet for all trees 4-inches d. b. h. and larger. Volumes will be computed in board feet local Doyle (usually including one bark in diameter and scaling length in feet as board-foot volume for logs less than 8 inches in diameter), and International 1/4-inch rules for saw-timber trees 10-inches d. b. h. and larger. The method sketched on page 13 for conversion to each of several scales is recommended for use as soon as coefficients are available.

The volume of the annual cut will be regulated by the volume of the periodic annual increment, except where it is desirable to harvest defective, diseased or undesirable trees in stand improvement. A rough guide is to cut half the volume of the increment in stands with less than 2 M board feet of sawtimber (International 1/4-inch) per acre and to increase this proportion in better stocked stands up to the full volume of increment in stands with 10 M board feet per acre. Generally area control will not be used, but cuts other than for stand improvement will be made principally in over-stocked groups of trees.

Annual cuts are desirable, but where the stand will not justify a commercial cut, a waiting period will be recognized. The increment obtained and the stand improvement measures used during the waiting period will be recorded.

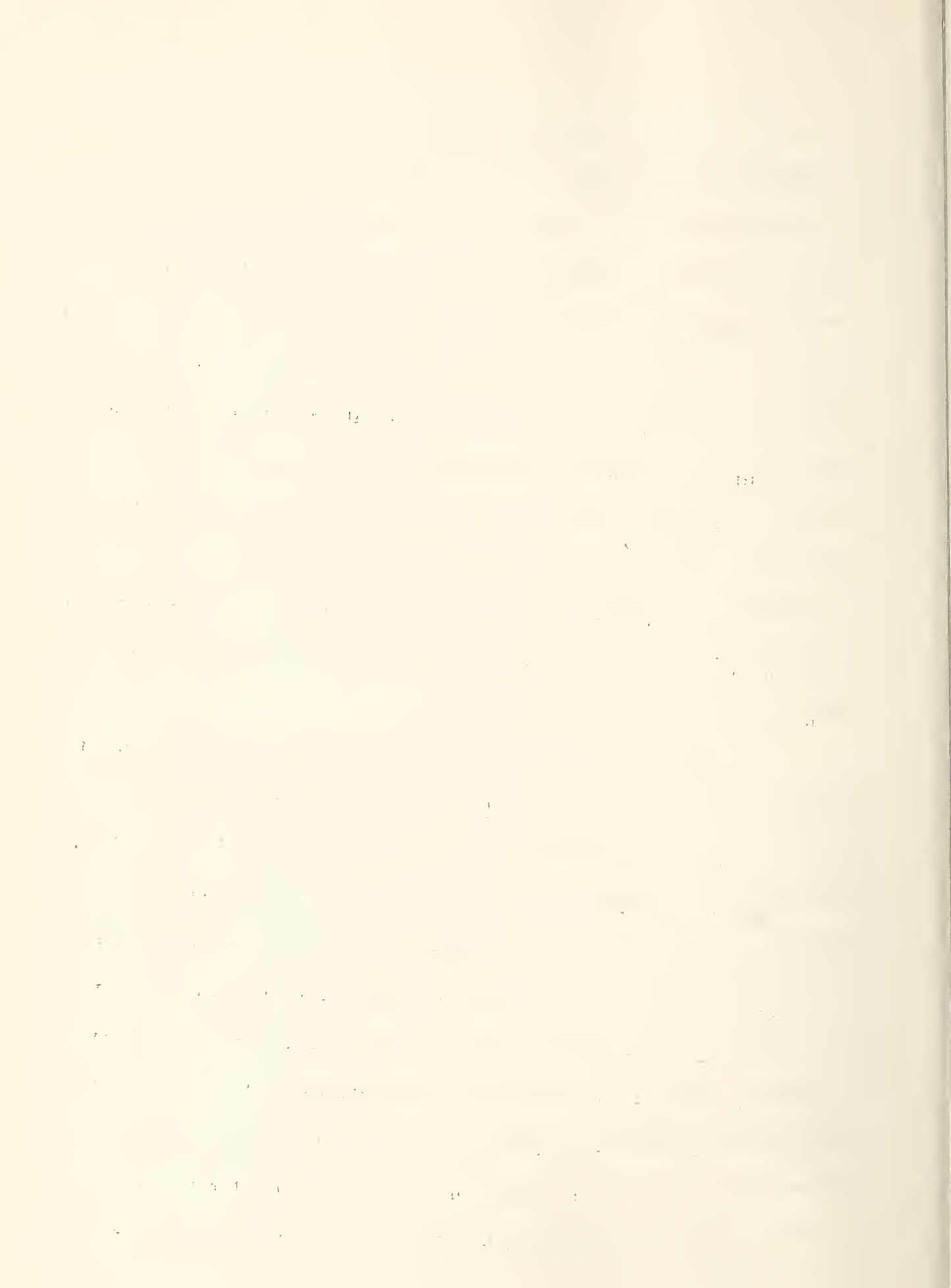
III. Harvesting

Before harvesting the allowable cut, the trees from which it will be taken will be carefully selected so as to utilize financially mature trees and leave the stand in improved growing condition and with better quality growing stock. Man-hour requirements and out-of-pocket costs, as marking paint, will be kept. The marked trees will be tallied by diameter classes and volumes will be determined from local volume tables. The number and volume of trees by diameter classes will be recorded in the ledger.



The products harvested from the trees marked for cutting constitute the annual yield. These products will be measured or estimated in units common to the region. Sawlogs will be scaled in board feet using most commonly the local Doyle rule. Pulpwood and fuel wood will be measured in standard cords or units for wood longer than 4 feet. Poles, piling, ties and mine props will be measured or estimated by the piece and grouped by size or quality classes. Total lineal feet of poles and piles will also be recorded. Gum will be reported by the standard barrel. Each branch will record the volumes of yield in terms of products sold. They need not be converted to a common unit of measure, but yield records will be kept separate and distinct from the continuous inventory records. Man-hour requirements for check-scaling cut products, will be recorded.

The value of the products harvested annually should be computed at three stages of production: (1) as stumpage, (2) when cut and delivered at road, and (3) when cut and delivered at railroad or plant. Although few road-sidesales are now made, farmers can cut and skid products for purchaser's trucks to pick up, so branches should make special effort to procure dependable road-side values which reflect reasonably accurately the money value of the extra effort. To arrive at values that are close to the average in the Branch's territory, current prices paid for stumpage, road-side and delivered products should be obtained from several reliable purchasers scattered throughout the territory. These average prices instead of actual sale prices, which



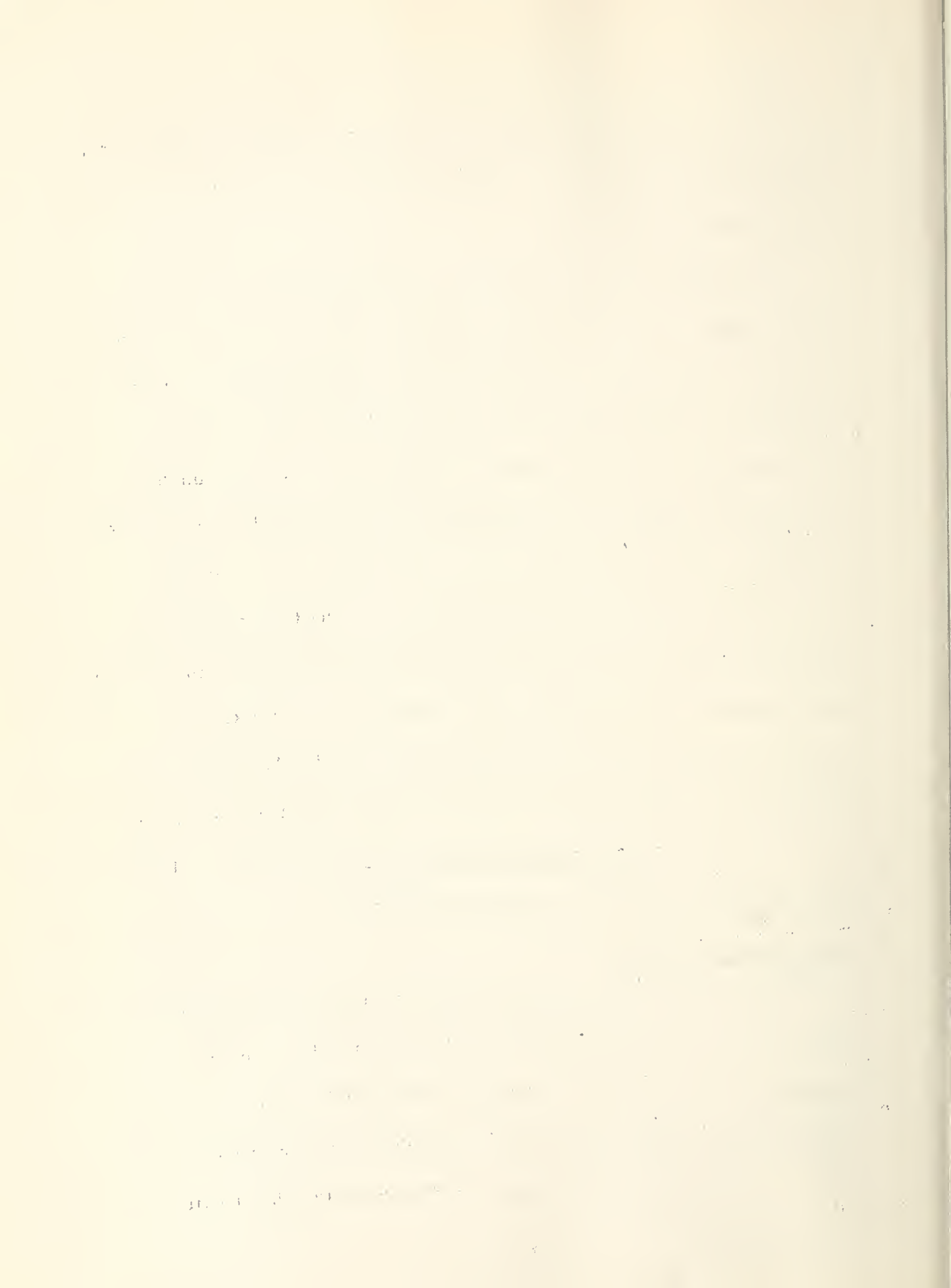
may be above or below current prices available to small forest owners, should then be applied to the products cut in order to obtain gross income from the farm forestry unit.

No uniform method of logging is recommended, nor is it recommended that detailed logging costs be collected unless the branch is doing its own logging, or has access to reliable logging costs that are applicable to small logging jobs. Records of man-hour and team- or farm-tractor-hour requirements for felling and bucking and bunching of products at roadside are especially needed and should be collected if available. Where the branch does its own logging, costs should be recorded in man-hour requirements and as operating (direct) and fixed (indirect) costs for each step in the logging operation. The methods used by Reynolds in Occasional Paper 121 "Pulpwood Production Costs" and by Osborn in Occasional Paper 124 "Costs of Producing Mine Props" in separating operating and fixed costs of logging equipment are recommended.

Likewise, costs of naval stores operations should not be collected in detail unless the branch runs its own operation.

IV. Reporting Results

Annually a brief progress report, giving yields and gross incomes from products, man-hour and out-of-pocket costs of silvicultural and management practices and of logging, if available, will be prepared. Only essential data, which will be of interest and use to the branch in future work or in preparing future reports, will be included. It will not be published.



A brief mimeographed folder, or leaflet, composed chiefly of tables summarizing original and present growing stock and total gross income for all years operated and for the current year, is recommended. The chief purpose of this report is for distribution to visitors and to a mailing list of persons especially interested in farm forestry in the branch's territory. The following tables are suggested for this purpose, but they should be modified by each branch to suit its own dates of operation, utilization requirements and units of measure, values per unit, and other local conditions and circumstances. Total board foot volume (Doyle) should be footnoted, showing total board foot volume (International 1/4) for comparison when the conversion is available.

Table 1. -- Original stand per acre 1947 compared to present stand in 1952

Year	Number of trees			Volume		Annual growth	
	4"-10"	10" +	Total	4" +	10 +	10 +	
	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Cu.ft.</u>	<u>Std.</u> <u>cords</u>	<u>Bd. ft. (Doyle)</u>	<u>Bd. ft. (Doyle)</u>
1947							
1952							

Table 2. -- Total harvest 1947-1952, inclusive

Item	Logs	Poles	Pulpwood	Fuel wood	Naval stores	Total
	<u>Bd. ft.</u>	<u>Number</u>	<u>Std. cords</u>	<u>Std. cords</u>	<u>Barrels</u>	
	<u>(Doyle)</u>					

Total volume

Volume per acre

Value (dollars) on stump

Total value

Per unit

Per acre

Per acre-year

Value (dollars) delivered at roadside

Total value

Per unit

Per acre

Per acre-year

Value (dollars) delivered at market

Total value

Per unit

Per acre

Per acre-year

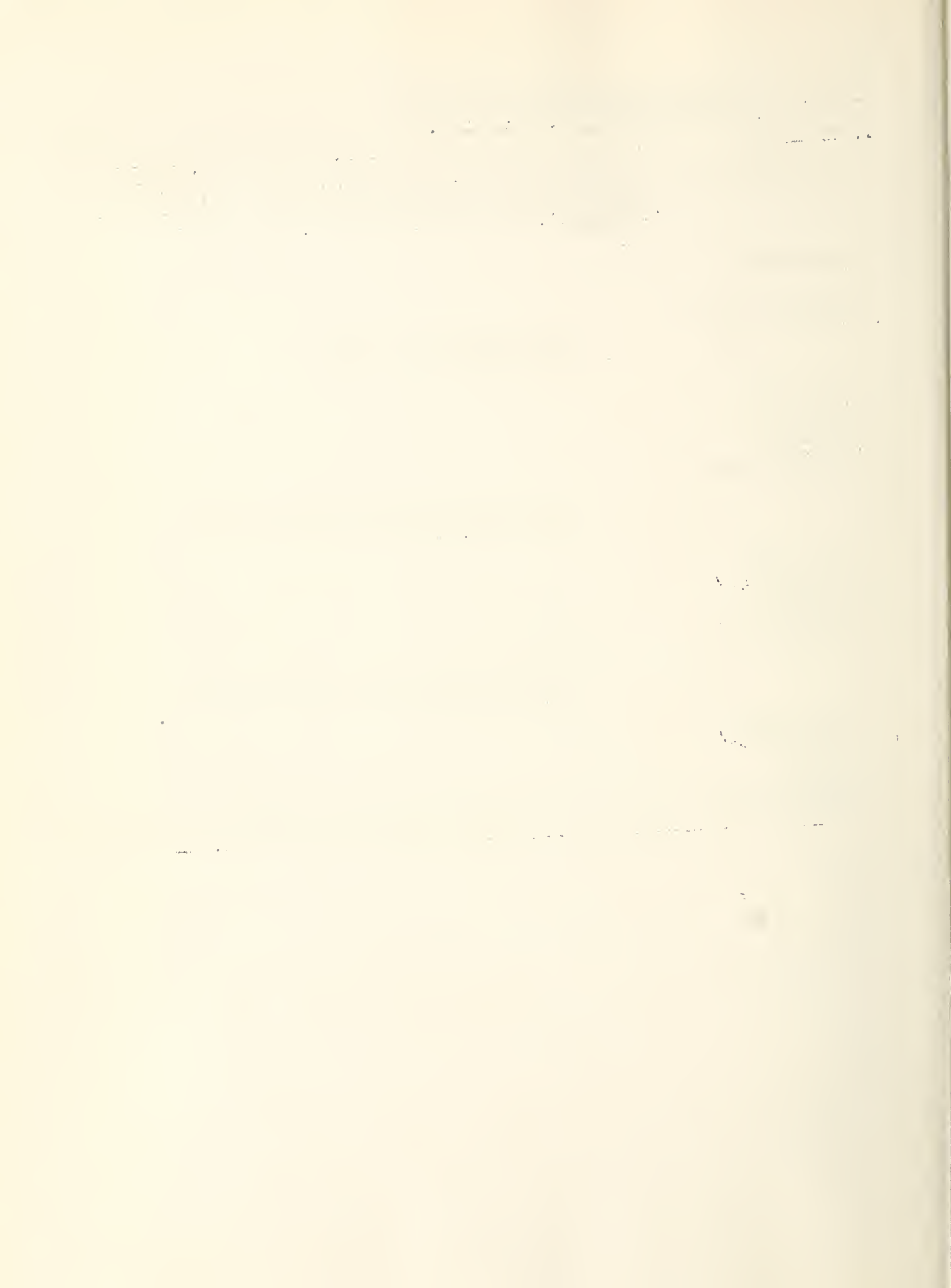


Table 3. --1952 Crop

Item	Logs	Poles	Pulpwood	Fuel wood	Naval stores	Total
	<u>Bd.ft.</u> <u>(Doyle)</u>	<u>Number</u>	<u>Std. cords</u>	<u>Std. cords</u>	<u>Std. bbls.</u>	

Total volume

Volume per acre

Value (dollars) on stump

Total value

Per unit 1/

Per acre

Value (dollars) delivered at roadside

Total value

Per unit 2/ 2/

Per acre

Value (dollars) delivered at market

Total value

Per unit 3/ 3/

Per acre

Man-hours of employment cutting and bunching
at roadside

Total hours

Per unit 3/

Per acre

Man-hours of employment loading and hauling
to market

Total hours

Per unit

Per acre

1/ Average stumpage value: Pine \$ ___ per M (Doyle), Hardwoods \$ ___ per M (Doyle).

2/ Average road-side value: Pine logs \$ ___ per M (Doyle), Hardwoods \$ ___ per M.

3/ Average mill value: Pine logs \$ ___ per M (Doyle), Hardwoods \$ ___ per M (Doyle).

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

At 5-year intervals, after the 100 percent reinventory has been made and periodic increment has been computed, a detailed progress report will be prepared. It will cover changes in volume and composition of the growing stock, periodic increment, products harvested, gross returns, costs, net returns, and forestry practices followed. Allowable cuts for the subsequent five years will also be estimated and reasons for any change discussed. Any other phases of special interest will be included. There is no rigid outline for this report, but emphasis and subject matter to be covered will be left to each branch station. This report should be prepared in such form that it might be published as an Occasional Paper. Results will be summarized in articles for farm papers, trade journals, or other suitable publications.

The actual yields and incomes from farm forestry units and labor requirements and costs of obtaining them are needed for the Station's Annual Report. In order to make the results from all branches readily comparable, they should be expressed on an acre basis. It is suggested the data be confined to those listed in and presented in the same form as tables 1, 2, 3, 4, and 5. It is not expected that all branches can furnish all data immediately. With shortages of personnel and limited budgets, it is not recommended that any of the branches make special effort to collect data other than that which is regularly collected. The following data are needed:

1. Yield and income data

The data included in tables 1, 2, and 3 above will give yield and income data needed. Since in our annual report most studies show volumes

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based on International 1/4-inch scale, the volumes in table 1 should be given in both local Doyle and International 1/4-inch scales. Volumes in tables 2 and 3 cannot always be readily converted and most of them can stand as they are. Total board foot volumes (International 1/4) and total cubic foot volume should be presented if the conversions can be made satisfactorily.

2. Costs of producing and delivering products

These data will be supplied only by branches which do their own logging or have access to data applying to small properties. Costs data should be supplied in form of table 4. Labor requirements are included in table 3.

Table 4. -- Costs ^{1/} per acre of producing and delivering products

Item	Logs	Poles	Pulpwood	Fuel wood	Naval stores	Total
	----- <u>Dollars</u> -----					
Cutting and bunching at roadside						
1. Operating						
2. Fixed						
3. Total						
Loading and hauling to market						
1. Operating						
2. Fixed						
3. Total						

1/ Exclusive of costs of labor.

3. Costs of management

The per acre costs of silviculture, regulating the cut, protection, taxes, and marking timber and scaling products for timber sales should be reported in tabular form as shown in table 5.

Table 5. --Man-hour employment and costs of growing and harvesting farm timber crops

Items	Annual costs per acre					
	For area covered			Amort. period (years)	For whole area	
	Area	Man	Other		Man-	Other
	covered	hours	costs		hours	costs
	<u>Acres</u>		<u>Dollars</u>			<u>Dollars</u>
Investment costs						
Planting						
100% inventory						
Hardwood control						
Prescribed burning						
Operating costs						
Marking trees						
Scaling cut products						
Fixed costs						
Taxes						
Fire protection						

Recommendation for Continuance of Studies

The studies of financial aspects of farm forestry have proved very practical and useful to farmers and other small owners. No doubt the results of these studies have played an important part in furthering and encouraging the practice of good forestry on farms and other small units. Each year additional data on costs and returns are compiled and management experience on small properties is added to. As case studies, available to extension agencies and small owners, they also increase in value annually. They will be still more valuable if they can be made more uniform by following the recommendations for conduct of studies made as a result of this analysis. It is recommended that they be continued indefinitely.



